exhibits very marked hysteresis with respect to H and B. Over a part of the cyclic h–B curve, the direction of h is *opposite* to that corresponding to the direction of the induction at the centre of the wire. The results obtained show that the method of "shearing" usually adopted to correct B–H curves for the effects of the de-magnetising force must be used with great caution.

The paper is illustrated by diagrams of apparatus and by curves showing the experimental results.

"Thermal Adjustment and Respiratory Exchange in Monotremes and Marsupials.—A Study in the Development of Homothermism." By C. J. MARTIN, M.B., D.Sc., Acting Professor of Physiology in the University of Melbourne. Communicated by E. H. STARLING, F.R.S. Received May 14,—Read June 6, 1901.

(Abstract.)

A number of observations on the relations between the body temperature, and the temperature of the surrounding medium, and on the respiratory exchanges in monotremes and marsupials are recorded. The results are compared with those obtained in control experiments with cold-blooded animals (lizards) and higher mammals.

The main conclusions arrived at are—

1. Echidna is the lowest in the scale of warm-blooded animals. Its attempts at homothermism fail to the extent of 10° when the environment varies from 5° to 35° C. During the cold weather, it hibernates for four months, and at this time its temperature is only a few tenths of a degree above that of its surroundings. The production of heat in Echidna is proportional to the difference in temperature between animal and environment. At high temperatures, it does not increase the number and depth of its respirations. It possesses no sweat glands, and exhibits no evidence of varying loss of heat by vaso-motor adjustment of superficial vessels in response to external temperature.

2. Ornithorhyncus is a distinct advance upon Echidna. Its body temperature though low is fairly constant. It possesses abundant sweat glands upon the snout and frill, but none elsewhere. The production of carbonic acid with varying temperatures of environment indicates that the animal can modify heat-loss as well as heat-production. Its respiratory efforts do not increase with high temperatures.

3. Marsupials show evidence of utilising variations in loss to an extent greater than Ornithorhyncus, but less than higher mammals. Their respirations slightly increase in number at high temperatures.

4. Higher mammals depend principally upon variations in heat-loss, in which rapid respiration plays an important part.

5. Variation in production of heat is the ancestral method of homothermic adjustment. During the evolution of the warm-blooded animal it has, through developing a mechanism by means of which it can vary production in accordance with heat lost, overcome one disadvantage of cold-blooded animals, viz., that activity is dependent on external temperature. It has thereby increased its range in the direction of low temperatures. Later, by developing a mechanism controlling loss of heat, it has increased its range in the direction of high temperatures, and also rendered body temperature largely independent of activity; these advantages have been gained by a greater expenditure of energy.

"On the Elastic Equilibrium of Circular Cylinders under certain Practical Systems of Load." By L. N. G. FILON, M.A., B.Sc., Research Student of King's College, Cambridge; Fellow of University College, London; 1851 Exhibition Science Research Scholar. Communicated by Professor EWING, F.R.S. Received May 20,—Read June 6, 1901.

(Abstract.)

The paper investigates solutions of the equations of elasticity in cases of circular symmetry, and it applies them to discuss the elastic equilibrium of the circular cylinder under systems of surface loading which do not lead to the simple distributions of stress usually assumed in practice.

The analytical method employed has been to solve the equations of elasticity in cylindrical co-ordinates, obtaining solutions in the typical form $\begin{matrix}\cos\\ \sin\end{matrix}\left\{ kz \right\} \times$ (function of r), r being the distance from the axis and z the distance measured along the axis.

More general solutions, not necessarily symmetrical about the axis, have been given by Professor L. Pochhammer* and by Mr. C. Chree.† Professor Pochhammer has used his results to deduce approximate solutions for the bending of beams. Neither Mr. Chree nor Professor Pochhammer has, so far as I am aware, worked out his solutions in detail for such problems as are discussed in the present paper.

I found that solutions in trigonometrical series would be sufficient to satisfy most conditions in the first of the three cases discussed, and all

* 'Crelle's Journal,' vol. 81.

† 'Cambridge Phil. Soc. Trans.,' vol. 14.